



# Gen Al 4 Science Tools that can be helpful

https://hun-ren.hu/ai-4-science

## There are exceptionally many Nobel prizes that went to Al related research



### Al related Nobel prizes for 2024

## **Physics**

John J. Hopfield and Geoffrey Hinton for their fundamental discoveries and

inventions enabling machine learning through artificial neural networks.





### **Economics**

Daron Acemoglu, Simon Johnson, and James A. Robinson for their study on the emergence of institutions and their impact on prosperity.

### Chemistry

David Baker for the computational approach to protein design. Demis Hassabis and John Jumper for protein structure prediction.









## News is all around about Al enabling research



### Introducing Aurora: The first large-scale foundation model of the atmosphere

Published June 3, 2024

By Wessel Bruinsma, Senior Researcher; Megan Stanley, Senior Researcher; Ana Lucic, Researcher; Richard Turner, Visiting Researcher; Paris Perdikaris, Principal Research Manager

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Simulating millions of LLM agents with AgentTorch

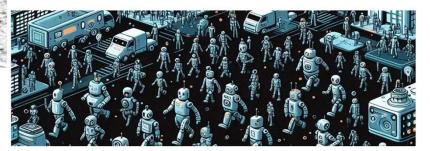
By Ben Dickson - October 2, 2024











### sakana.ai

The AI Scientist: Towards Fully Automated Open-Ended Scientific Discovery August 13, 2024



NEWS 11 November 2024 | Correction 14 November 2024

## Al protein-prediction tool AlphaFold3 is now more open

The code underlying the Nobel-prize-winning tool for modelling protein structures can now be downloaded by academics.

By Ewen Callaway







## Al can help researchers in all kinds of tasks



### CLASSIC AI

### **GENERATIVE AI**

### **SUPPORTIVE**

Enhanced research capabilities

### **TRANSFORMATIVE**

New research capabilities

Easier, deeper, multi-modal data analysis capabilities

New simulation, data collection, and methodological opportunities (e.g. Alphafold) Easier, higher-quality writing, coding, and documentation analysis

New modelling opportunities (e.g. Computational social science)

## We launched HUN-REN AI 4 Science program





## HUN-REN AI 4 SCIENCE PROGRAMME

Enhancing the use of artificial intelligence in the Hungarian Research Network



## **Building on 4 main pillars**



### **HUN-REN AI4S PROGRAMME SERVICE MAP**

#### **AI AMBASSADORS' NETWORK**

An Al inspiration programme and support tailored to the unique needs of research institutions

### **HUN-REN HQ AI Support Services**

### AI EDUCATION AND SOURCE OF INSPIRATION

- Introductory Al training
- Specialised training programmes

## PERSONAL AI SUPPORT

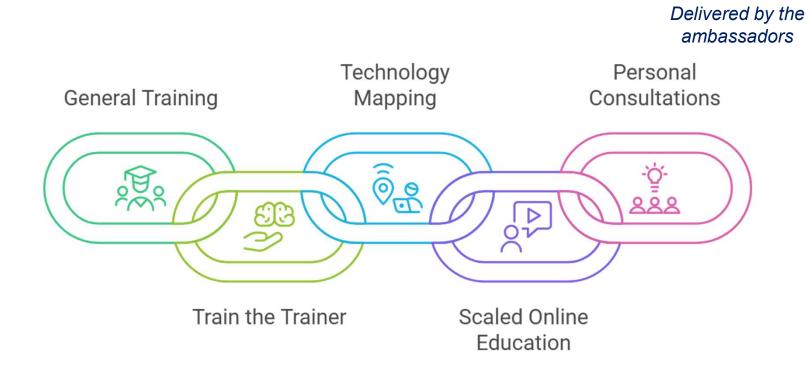
- HUN-REN HQ AI expert group
- · External expert team
- Al research partner finder

## AVAILABLE AI TECHNOLOGIES

- Custom Al framework
- Computational infrastructure

## Scaling up training with centralized and distributed efforts





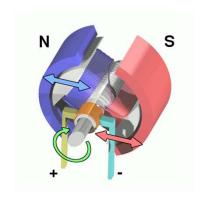
## A LOT of tools...



Név	Link	Description
		Automatikusan javasol kapcsolódó tanulmányokat, gyorsítva a
ResearchRabbit	https://www.researchrabbit.ai/	kutatási anyagok gyűjtését és áttekintését.
		Tudományos cikkek elemzésére és az összefoglalók készítésére
		szolgál, hatékonyabbá téve az irodalomkutatást.
Typset.io	https://typeset.io/	
		Interaktív jegyzetfüzet Al támogatással, amely segíti a komplex
		számítások és adatvizualizációk végrehajtását.
NotebookLM	https://notebooklm.google/	
		Vizuális ötletgenerátor és gondolattérkép készítő eszköz, amely
		segít a koncepciók átlátható bemutatásában és megértésében.
napkin.ai	https://www.napkin.ai/	
		An Al tool that helps researchers find and understand scientific
		literature by automatically extracting key information from papers.
Scite	https://scite.ai/	
		Tudományos kérdésekre ad összegző válaszokat, segítve a
		kutatókat a releváns szakirodalom gyors áttekintésében.
Consensus	h///	
Consensus	https://consensus.app/	Támogatja a kutatás kérdésmegválaszolását és adatgyűjtést,
		The state of the s
Elicit	https://elicit.com/	lehetővé téve a hipotézisek strukturált tesztelését.
Elicit	nttps://eticit.com/	
	https://claude.ai/login?returnTo=	
Claude	%2F%3F#features	
Cudde	war wormedutes	Gyors és pontos válaszokat kínál tudományos kérdésekre valós
		idejű adatforrások felhasználásával.
		itueju adatioitasok letitasztiatasavat.
D 1	[	
Perplexity	https://www.perplexity.ai/	
OL OPT		Szövegelemzésre, kódírásra és cikkösszegzésre használható,
ChatGPT	https://chatgpt.com/	megkönnyítve az adatfeldolgozást és dokumentációt.
OL IDDE		Lehetővé teszi PDF-ek gyors áttekintését és összegzését, amely
ChatPDF	https://www.chatpdf.com/	segíthet komplex dokumentumok elemzésében.







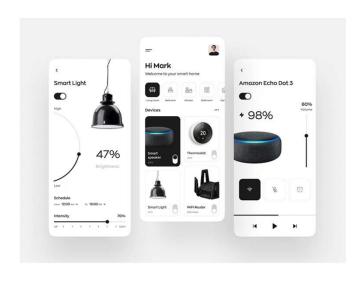


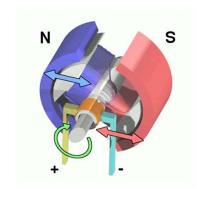
USER INTERFACE / APP

CENTRAL ENGINE

TASK TO COMPLETE









USER INTERFACE / APP

CENTRAL ENGINE

TASK TO COMPLETE





### **APPLICATIONS**

- chat.openai.com
- Copilot.Microsoft.com
- chat.mistral.ai/chat
- Perplexity.ai
- GenAl4Science
- NotebookLM.google
- Scispace.com
- Napkin.ai
- Github Copilot
- Cursor.ai



### **LLM MODELS**

- GPT 4o
- Claude Sonnet 3.5
- Gemini 1.5 Flash
- Mistral Large
- Qwen 2.5 72B
- LLaMa 3.2 8B



### **TOOLS TO ACCESS**

- Bing search
- Google search
- Elicit search
- Consensus search
- Code Interpeter
- Dalle 3

## How can we imagine LLMs?





### **TRAINING**

**SKIMMING** through tons of books, articles, research papers, github code...

The Pile: approximately 500 000 000 pages of text



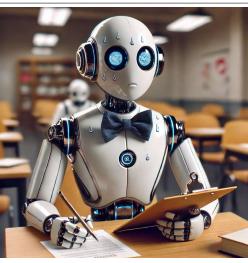
### GENERAL, WIDE, SHALLOW KNOWLEDGE

Whatever sticks from skimming through A LOT



## CAPABILITY OF USING LANGUAGE

Understanding instructions and context and writing in **any** style required



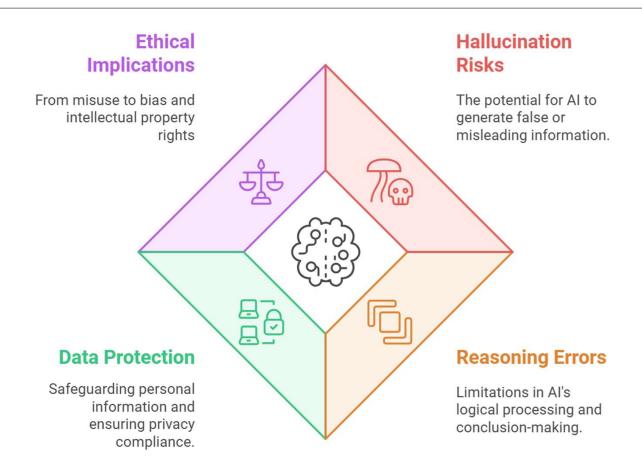
### **EXAM**

Whatever comes to mind! Always follow instructions! Read context given carefully!

Transforming text to text in a most probable way

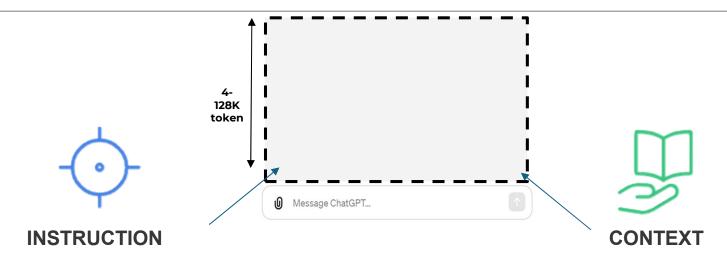
## What are the problems?





### What context window is used for?





How I want the model to behave?

- Task
- Role
- Examples
- Style
- Goal
- Guardrails

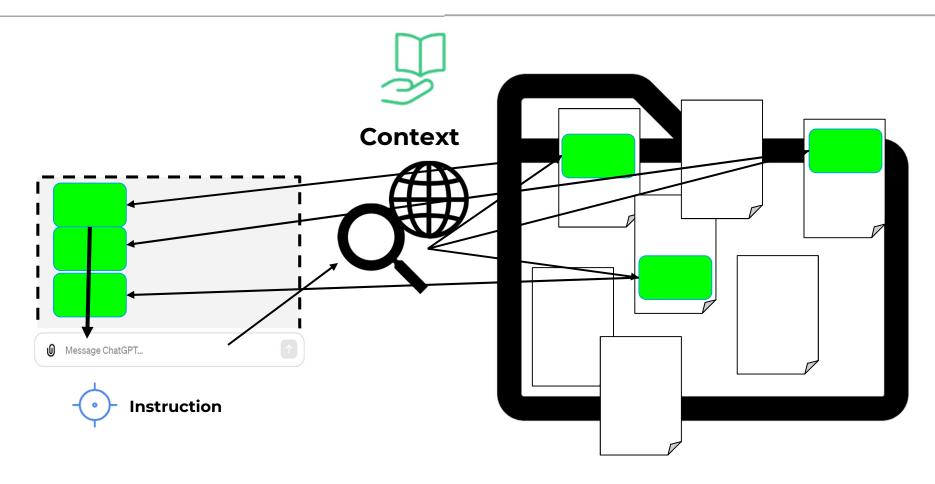


What I want it to keep in mind for the answer

- Text! (Not links)
- Can be long
- Can be unstructured
- It can

## **Extending beyond the context window**









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